USING DNA METABARCODING TO INVESTIGATE THE MEDICINAL PROPERTIES OF HONEY

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UNDERSTANDING THE FLORAL COMPOSITION OF HONEY

- Investigating honey bee foraging
- Verification of the stated botanical source and geographic origin
- Food safety and quality control
- Determine links between medicinal properties of honey and plant derived compounds and their potential for new drug discovery routes
To identify plant-derived antimicrobial compounds from Welsh honey against methicillin-resistant *Staphylococcus aureus* (MRSA)
**INVESTIGATING THE COMPOSITION OF HONEY**

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<td>Screen honey samples against MRSA by successive neutralisation</td>
<td>Use <em>rbcL</em> DNA marker to identify the botanical species present in honey</td>
<td>Extract and identify minor chemical components</td>
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ANTIBACTERIAL ANALYSIS

• 300 honey samples tested from hives located across the UK
• 88% of unprocessed honeys showed some level of inhibitory activity
• Activity was still seen following the removal of other known antibacterial factors from two samples from Tywyn and Bournemouth showed high levels of non-peroxide antimicrobial activity
• Suggests the activity is due to plant derived phytochemicals
DNA ANALYSIS

$rbcL$ DNA marker was used to act as unique identifier for plant species

DNA sequences were compared to Genbank which includes the Barcode Wales reference sequences for identification

dna extraction

Qiagen kits, modified for honey samples

Amplification

Core DNA barcode $rbcL$

Tag annealing

Unique identification
DNA tags adapted

NGS Sequencing

Roche 454 and Illumina

Analysis

Plant identification (BLAST)

FLORAL COMPOSITION OF TYWYN HONEY

- Galium odoratum
- Trifolium
- Hyacinthoides non-scripta
- Quercus
- Rubus
- Taraxacum
- Trifolium repens
- Brassicaceae
- Rosaceae
- Muscari
Chemical Analysis

Organic extractions
- Hexane
- Ethyl acetate
- Methanol

Separation
- Sephadex
- TLC
- Amberlite

Antibacterial activity
- Bioautographic overlay assay

Isolation
- Remove individual compounds

Identification
- Mass Spectrometry
- NMR
- HPLC

Pinobanksin-3-O-propionate
CONCLUSIONS

- Compounds from honey show good levels of antibacterial activity against hospital associated pathogens

- DNA metabarcoding was successfully used to characterise the plants which contribute to the making of the active honey samples

- Compounds identified using these approaches included pinobanksin derivatives and unknown compounds suggesting that the plants may be the original source of bioactive compounds

- Compounds may provide new leads that could serve as selective agents against antibiotic resistant bacteria
THANK YOU FOR LISTENING!